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ABSTRACT

This narrative recounts experiences at the Virginia Polytechnic Institute and State University in the design process of two university courses meant to test the potential and the limits of the technologies represented in the Internet. The courses described evolved as a means for teaching a junior and senior level political theory class for students at distant locations. These courses were designed to be fully Internet-based, i.e., students could take the class from anywhere if they had Internet access. These two courses were designed to exploit the capabilities of the World Wide Web to carry text, e-mail, and online chat sessions as the communications means for teaching political science without convening face-to-face meetings at preset times. The students were able to: access all course materials (syllabi, course assignments, and class notes), read the assigned texts in full, original forms, submit all graded work online and receive grades back online, and interact with the instructor and each other in one-on-one or group e-mail and chat sessions. The course was self-paced and self-directed. The course design was constrained by the need to make source materials available (finding already available text and securing copyright permission for other text), the need to implement standard hypertext markup language to present the text, maintenance of the Web site, and the administrative and institutional framework of a large university. (JLS)

Academic Infotecture: Course Design for Cyberschool

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Overview

We begin this with a commonplace: the internet is becoming ubiquitous, even in academia, and it is changing many things very quickly, including how we can teach. Seen by many as the defining technology for education in a post Cold-War era, the Internet stitches together numerous smaller networks around the world into one apparently global network. It now offers amazing promise as a virtual site for providing education to those who are able to become not collocated or synchronous with the physical plant of any material university campus. The WWW, then, is turned, at least in part, into a virtual environment in which we can fabricate sites/places/zones/spaces for conducting university instruction. Space conditions behavior, so new virtual spaces should allow us to experiment with new educational activities built for and around virtualized interactions.

This narrative recounts our experiences in the design process of two university courses meant to test the potential and limits of the technologies which are currently incarnated in the Internet. We designed and implemented these political theory courses to be fully internet-based; that is, a student could take the class(es) from anywhere--in town, around the state, across the world--if they had sufficient internet access. During the design and implementation of these courses, we made a number of decisions which carried with them some structural ramifications for the actual conduct of the course. This paper seeks to describe these decisions, the alternatives available to us, the

rationales for the choices which we made, and the implications (to the extent that these are discernible to us now) of those decisions.

These two political theory courses, or the standard Plato to NATO philosophy of politics survey, would be designed to exploit the capabilities of the World Wide Web to carry text, e-mail, and on-line chat sessions as the communicative means for teaching political theory without convening face-to-face meetings at pre-set times (the "credit-for-contact" model of teaching). So both courses would (dis)place or (re)position two existing lecture courses into forms for an asychronous tutorial by shaping the learners' behaviors of/for learning around various functionalities in/at a virtual class site. Most importantly, the students would be able to:

* access all course materials (syllabi, course assignments, class notes)
* read and/or pull down and print the assigned texts in full, original forms
* submit all graded work on-line, and receive grades back on-line
* interact with instructor and each other in one-on-one or group e-mail and webchat sessions

To put the best face on it, the courses were designed to operate as asynchronous Socratic dia/poly/logues in which questions could be posed and answered in response to student demand. In turn, their work was self-paced and self-directed as they downloaded texts, course briefings on the philosophers under study, and web chat exchanges.

This paper considers our dual roles as educators and infotects, and how these roles evolved in this project. Following this overview, we will then consider three different sets of requirements which had to be met for the class to be successful. Next, we will consider the design we used for the class, describe the ways our design attempts to meet the educational requirements for the course, as well as the ways in which it did not. We conclude by reconsidering our project, and the ways in which some of the constraints of this technology could affect the development of online education. Our discussion should prove useful to those who are considering using the Internet as a distance-learning tool. It also might prove useful for those who have begun to consider some of the ethical and political imperatives which the deployment of internet technology for instructional purposes implies.

Educational Infotecture

Educators in universities exist not only as teachers in the traditional sense, but inasmuch as they fabricate their own course materials, they also are designers of informational materials, packages, or sites. In creating the virtual site for an online class, we see this process as one of generating "infotecture." Infotecture arguably does not only exist in digital spaces, it also might be practiced wherever educators construct their own course materials. But, we want to address our infotectural practices in building a class site on the WWW.

The infotect, then, must embody previously separate fields of experience and practice, which is caught up within the roles of translator, engineer, teacher, architect, or troubleshooter.

This course exists as a means for teaching a junior and senior level political theory class in such a way that students not located in the same locality as the physical plant of the university could take the class with as much facility as possible. As part of the Cyberschool Initiative at Virginia Polytechnic Institute and State University, we designed and constructed a class site on the World Wide Web to serve this purpose. This section will focus on the design tasks we set out to bring this project online.

Design for digital environments is different from design in real world application. Traditionally, a designer was called in to give a proposed product a physical incarnation, and to provide a vision of materializing that commodity incarnation. The virtual design process, now is intimately bound up with the details of the product itself (what is it or how is it structured?) as well as with details of the virtual environment for the design (what requirements must we meet in order to be able to make the design a reality or how can we make the design a reality?).

It is the confluence of these previously separate sets of considerations which figures in the dialectic of enabling constraint. The dialectic of enabling constraint comes into play when institutional, cultural, economic, or material restraints

limit the many horizons of possibility for a project, but which, in the process of limiting these horizons, enable in a few certain ways the nature or direction for bringing the project to completion. We clearly were simultaneously enabled and constrained by the course materials with which we are working, by the technologies with which we hope to make our design a reality, as well as by the institutional framework within which we and those technologies work.[1] For our project, these three sets of constraints were: the course materials we wanted to present are almost exclusively textual (given a traditional understanding of 'text' as "words"); second, we were building our course on the WWW, using standard HTML to build the spaces; and, finally, we were working within the administrative and institutional framework of a large research university with its own institutional vision of what online education should and needed to be tied to a real-world "credit-for-contact" curriculum, and within a small department which is financially strapped at the present time. Each of these constraints dictated the attributes of the final course space in its own way.

Nonetheless, there are still degrees of freedom in which the infotect can help guide the formulation of the design and its specifications. At this point in time, determining with any precision what online courses are supposed to 'do' is a practice with which we do not have a great deal of experience.

Once the specifications and constraints for the project are in hand, the designer, as translator between theory and practice,

must actualize the goals of the design while remaining under existing constraints. The practice of translation here breaks down into two parts: the first is the translation of the goals of the project into more specific 'operational definitions;' and, second, the translation of the operational definitions to a design which is able to be accomplished within the technological, social, and institutional capabilities of the department, college and Internet. In our case, the first part of translation was not terribly difficult; the goal of teaching completely online the substance of a political theory class which would substitute within our curriculum for a regular sixteen-week "contact" class is fairly specific and 'operational.'

It is in the second phase of translation that the designer moves to consider the available technologies, and their appropriateness to the task at hand. These considerations cannot be merely instrumental, for it is at this stage that the ethical and political implications of technologies must be considered, as well.

Presently, those aspiring to teach classes online are typically those who actually are involved in constructing the cyberspaces from which they teach. Here again, the dialectic of enabling constraint is in force: the course(s) to be taught, the material to be covered, and the institutional context within which the project takes place, all constrain the way the class must function, making certain demands of any technology. At the same time, however, these constraints provide a set of guideposts

which we use to constantly evaluate progress. In addition, these constraints often offer certain frameworks which can be manipulated to suit the ends of the project.

Educators attempting to use online resources for teaching classes often find themselves acting as online troubleshooters, as well. First, as engineers responsible for the construction of the online versions of class, if there is a programming error within the class space, it is the educator/infotect's responsibility to repair or rewrite the code, so that the class site functions properly. Second, and perhaps more importantly, it is also the responsibility of the teacher to ensure that students having problems using the class are able to operate in the virtual environment without too much difficulty.

The addition of the role of infotect to those of the educator result in a tremendous increase in responsibility for how students learn. Not only must educators now convey knowledge and instruct, but they also now are responsible for the design, construction, and maintenance of the virtual environment within which their instruction is taking place.

Institutional Constraints

In order to understand why our project took the shape it eventually did, it is necessary to understand the institutional context within which we were working. Virginia Polytechnic Institute and State University, located in Blacksburg, Virginia, is an institution which has placed a high priority on networked

computing as part of its Instructional Development Initiative (IDI).[2] An integral part of the IDI at VPI&SU is the Faculty Development Institute (FDI); according to the University:

> The FDI initiative, an integral part of Virginia Tech's restructuring effort, has resulted in a more effective and efficient teaching-learning process for faculty and students.[3]

The primary goal of the FDI is "to provide an opportunity for faculty to re-examine curriculum issues and instructional methods that would allow them to adapt to the changing needs of students."[4]

The emphasis at the university level on networked computing provides the constituent departments and colleges in the university the pedagogical impetus and material wherewithal to experiment with different ways of teaching classes. It was from this support that our Cyberschool project arose.[5] The Cyberschool project began in Winter 1994 as an attempt to use desktop PC conferencing capabilities and WWW resources to virtualize VPI&SU's university courses. Two courses were packaged this way in Summer 1995, eight courses were offered through Cyberschool in Summer 1996, and now nearly 200 courses in all sessions of the 1996-1997 calendar with some Cyberschool aspects to them. We increasingly realize all of the old institutional forms are more limits on our labors than they are enhancements of the possibilities for Cyberschool.

The mission statement of the Cyberschool Project is worth quoting in full:

Cyberschool is an experiment to determine how best CMC

> (computer-mediated communication) technologies can be utilized at Virginia Tech in a range of courses in the College of Arts and Sciences. As a partnership between Arts and Sciences and the division of Information Systems, Cyberschool has an overarching mission: to redesign course offerings that take full advantage not only of what we are learning about instructional technologies, but also what we have discovered about the way students learn.
>
> Cyberschool courses share common characteristics such as computer conferencing systems, e-mail, bulletin board services, and use of the World Wide Web. More importantly, however, courses are designed to test the strengths and limitations of the new learning networks in a collaborative, interdisciplinary environment. Members of the Cyberschool team(s) are dedicated to improving their teaching effectiveness through a student-centered approach to learning. Findings are shared with the team(s) so that participating faculty and staff can explore the new environment together.[6]

It is this institutional framework which provided the context for our project. In this environment, there is an obvious privileging, at least at the rhetorical level, of those solutions for instruction which make use of computers for instruction.[7]

Institutionally, "Cyberschool has an overarching mission: to redesign course offerings that take full advantage not only of what we are learning about instructional technologies, but also what we have discovered about the way students learn."[8] The notion of ´redesign´ is ironic here, given that the possibilities of "redesign" are constrained due to the institutional framework of the already existing-university. Whether or not courses which are ´redesigned´ to fit into the already-existing mold of disciplinary, credit for contact built universities can truly take advantage of the potential presented by networked computing technology remains to be seen, but there are several problems to

be faced.

First, the definitions and metrics of what counts as a 'course' in the university constrain not only the efforts of educators working to develop courses for online instruction, but also constrain the expectations of students with respect to the time requirements needed to successfully complete a course, and the amount of work they need to complete a course. At present, instead of achieving the goals set out in Luke's "Going Beyond the Conventions of Credit-for-Contact," we are merely virtualizing the contact. Second, there is not at the university level a strong consensus as to the direction which the initiatives for educational computing needs to take. Whether the emphasis in the long run will be on constructing a completely internally wired campus, in which students need never leave their residence halls while they get their education, or on networked computing for distance learning as a way to extend the educational reach of the university, has not yet been clearly and firmly enunciated.

Presently, there is much being made of the movement toward networked computing, both within the university, as well as without. While the possibilities are indeed impressive, perhaps even staggering, it is important to keep in mind that the very institutionalized settings which enable certain practices, can do so only within those settings, and that in order to get outside or beyond the limits of those settings for teaching out of a built environment or credit for contact curricula, we must begin

to question them.

Material Considerations

The second set of considerations which we had to take into account in the design of the CyberTheory courses was that the material which was the subject of the course was exclusively textual. Political theory, at least to date, is written. What this means for those wishing to teach political theory online, is that the sites used to teach classes online will be very word-centric. Before continuing with our discussion of the role these considerations played in the design of the course materials online, we must recognize that much of the discussion in this section could be viewed as overlapping with the discussion in the next session pertaining to technological considerations. For the present study, we are separating them not out of a philosophical mandate that content and medium must be separate, but out of the convenience in presentation one realizes by their separation.

In the PSCI 3015 course, readings begin with Plato and continue through Machiavelli. Each text was presented on the website in chunks as part of a virtual anthology; that is, the sections which were assigned sequentially appeared on the same webpage. While this method of splitting the readings up on the website made for some long web pages, it was necessary as time for site development was limited. Access to the texts for the 3015 class was relatively unproblematic; all the texts but one were either already available online as webpages or sites all

their own, or were available as text- or ASCII-formatted files which can be easily converted to WWW (HTML) form. The only exception here was Polybius' The Rise of the Roman Empire; the students could only buy the paper text version or read it on library reserve. Since there was no problem in obtaining the texts for this class, it was relatively easy to put together a fully electronic library where the students could get the readings for themselves, at much less expense than if they purchased the books themselves. Still, several texts, which are normally covered in the 3015 class, were dropped from the reading list due to problems with accessibility.[9]

It was a different story, however, for the PSCI 3016 class. While in the end we were able to provide all the texts for the class online, it was not nearly as easy. The reading list the regular 3016 classes normally runs from Hobbes through Milton Freidman; due to copyright restrictions, the summer course was able only to cover Hobbes through Mill and Marx. With the exception of Mill, all the texts were available online in some form. In order to find the Mill, we had to purchase through the university a CD-ROM of political philosophy. The licensing requirements of the CD-ROM meant that we had to install a password-protection system on our site, and limit access to the Mill text to only those students taking the class.

Technical/Technological Considerations

In this section, we will discuss the implementation we used

for these classes in an attempt to meet the three sets of requirements we set out above. The technological frame which we used had to satisfy each of the different sets of requirements set out above, if the implementation was to be considered a success, and as a solution which could be reused in the future.

As was mandated indicated within the mission statement of the Cyberschool, the course was to have used the WWW to distribute class materials, class discussion, and assignments. That the WWW was to be used offered us certain benefits, but also implied certain constraints. The benefits and constraints were further narrowed for us by the institutional considerations mentioned above, as well as by the nature of the material to be conveyed in the classes.

Our virtual site was built on the World Wide Web, using the HyperText Markup Language (HTML). The specification which we relied on most heavily was version 2.0 of HTML, which supports frames and certain other formatting tags. This specification was adopted over the older HTML 1.0 specification because it offered enhanced formatting and display capabilities; it was used instead of the provisional HTML 3.0 standard because, at the time the classes were conducted, the two major WWW browsers (Netscape Navigator and Microsoft Internet Explorer) did not completely support the HTML 3.0 specification.[10] The need to choose which HTML specification to support points to one of the problems with attempting to maintain a course site on the WWW: Can one ever stop updating the site? Given the speed with which new

innovations appear on the WWW, it seems that some division of labor between the HTML programmer and the educator teaching a class is necessary and inevitable.[11]

Our use of frames within the HTML specification allowed us to design the site so that certain 'pages' of information could remain simultaneously in view for the majority of the session. There are two major examples of this. The first is the contents page; which, at the beginning of a session, always appears in the right-hand frame. The contents page provided direction to the different levels of the site, specifically to: 1) the syllabi for PSCI 3015 and PSCI 3016, respectively; 2) the reading list for the respective courses; 3) assignment lists for each course; 4) brief discussions of the philosophers whose works were under study; 5) 'briefings' which served as surrogates for lecture notes concerning the philosophers and works under consideration; and, 6) the 'chat' space, which allowed for student-student and student-teacher conversation and discussion.

The second major example of the use of frames is the navigation bar which was always present in the bottom frame; this provided links to the Contents page, an Orientation page that sketched a preliminary overview of the courses, links to each course's syllabus, a link to an acknowledgment page, and a blinking invocation to complete a survey which was used by the University to analyze the results of the Cyberschool courses. Some of the material in the bottom navigation bar is redundant vis-á-vis the contents page, but was included because these

seemed to be the spaces which were most important and which provided links to everything else. More importantly, is the fact that the navigation bar was always present in the site, while sometimes the contents page was replaced by other sub-contents pages, for example, lists of readings, assignments, or philosophers. The omnipresence of the navigation bar, however, meant that the table of contents was always only a click away.

Another example of our use of the HTML specification was the inclusion of online images within the website. These had a dual purpose; on one hand, they were included within the site to provide some visual interest for a site that otherwise would have been almost exclusively textual;[12] on the other hand, the images were carefully selected to provide context for the material appearing on the where the images appeared.

A final example of the use of HTML is the color scheme of the website. By default, webpages in the major browsers appear as gray pages with black text, with unfollowed links appearing in blue, and followed links in purple. By applying custom colors to the website, we were able, hopefully, to distinguish our site from more 'generic' sites, as well as to give our site, and by extension, the class a more unique visual identity.

The use of the WWW as a platform for the course required work-arounds in order to meet some of the institutional requirements, particularly those which mandated a form of intra-class communication. The WWW was not originally intended as a person-to-person communication medium, but rather as an

online broadcast system. In some respects, this is a boon for our particular project, as so much of it was oriented toward the presentation of the course materials to multiple students; this did, however, present some problems which forced us to either look outside of the WWW to communicate some material, or to take advantage of some innovations which have been made in embedded or linked applications within websites. Two such cases spring immediately to mind: the first is the handling of student assignments, and the second is the handling of student-to-student and student-to-professor communication.

In both cases, students were given two options online.[13] For assignment submission, a CGI (Common Ground Interface) script was employed to handle the submission of assignments. Students would type their responses to questions within text boxes on a submission page (although more often they 'pasted' answers written within a word processing application into the text boxes), which were then logged at the website and printed off for evaluation. If the students did not feel comfortable using the webpage to submit assignments, they were given the option of emailing their assignment directly to the professor. Most students actually employed the email option, as they received acknowledgment of the receipt of their assignment faster than via the webpage. Similarly, online discussion could occur either on a WebChat page (also accomplished with a CGI), or via email. While there was some discussion on the chat page, it tended to be of a two-way (student-to-professor) nature, rather than a 'group'

discussion. Most of the discussion in the class, occurred using direct email between individual students and the professor.

The dictates of Cyberschool are to offer course instruction outside of Blacksburg's classrooms; so our courses stripped classtime out of lecture halls, put it online, and refashioned discussion asychronously into one-on-one or small-group chat exchanges from in class debate. It worked, but we are less certain that this approach is the optimal path for the future. For those needing a "distance education," such mediations may well prove more suitable than two-way interactive TV classrooms. But for students who are able to colocate synchronously at a campus, it is not obvious how this approach adds value to existing practices beyond the texts and course briefings affording new study aids or the chat session building class-specific feelings of community.

That more 'group' discussion did not occur during the class is one of the problems that we have yet to resolved for this project. On one hand, it is perhaps technically feasible (using the webchat space) to hold more synchronous online sessions, where group discussion can occur; on the other hand, however, requiring students to be at their machines for a set amount of time at a given time seems to defeat one of the goals of distance learning, which is to allow students to complete the work for a particular class as their schedule permits. Since one student was in New Zealand, one was in Richmond, VA and all of the others were in and out of Blacksburg, a virtual office hour/class with

"full attendance" was impossible to realize. This is one side of the virtualizing credit-for-contact model which needs to be more critically examined.

It is clear, we believe, that there are different sets of constraints which simultaneously limit and enable what we are able to do when we attempt to teach classes online. Of the three sets of constraints which exist right now, the administrative or institutional set presents the most serious long-range threat to the success of online classes. Without an institutional consensus concerning the role online education is to have within the mission of the university (and indeed, the university's mission itself needs to be rethought), there can be no serious direction given to technological development, and the adaptation of instructional materials for online education.

Endnotes

1. With 'institutional framework' we intend not only the fact that our work goes on within the university, but also within a particular financial or economic framework within the university. Institutional framework can therefore be examined at least two different levels.

2. Information on the IDI can be found on the WWW at http://www.edtech.vt.edu/idi.html.

3. http://www.edtech.vt.edu/innovations/innovate.html.

4. http://www.edtech.vt.edu/idi/fdi/Description.html

5. Not only did he teach the classes which are the subject of the present paper, he also was the author of one of the documents upon which the VPI Cyberschool project is founded -- "Going Beyond the Conventions of Credit-for-Contact: A Preliminary Proposal to Design a "Cyberschool" for VPI&SU." This document is available online at http://www.cyber.vt.edu/docs/luke.html.

6. http://www.cyber.vt.edu/docs/cyber.mission.html

7. This privileging, which on paper looks quite unambiguous,

was not uniform 'on the ground.' John Moore, the director of Educational Technologies, often sought to apply already existing technologies where they were appropriate.

8. op cit. "cyber.mission.html."

9. These included the Tao te Ching, the Analects of Confucius, as well as the Koran.

10. It should also be noted that, to date, each of the major browsers supports some of the HTML 3.2 (the current specification) tags in non-standard or proprietary ways; further, each of the browsers has proprietary tags which the other browser does not support. The upshot of this is made manifest in the proliferation of 'Best Viewed with Netscape' or 'Best Viewed with Internet Explorer' tags appearing on websites. Our site, due to the institutional support at VPI&SU for Netscape Navigator was 'optimized' (a euphemism, admittedly) for use with the Netscape browser.

11. It must be noted here that the innovations which appear on the Web at an ever-increasing (it seems) rate are not confined strictly to innovations in HTML. Keeping abreast of the latest developments in the HTML specification is difficult enough; the expectation that educators wishing to use the Web will maintain expertise in HTML, as well as the

languages used to build in functionality on web pages (JAVA, perl, C++, to name a few), as well as the different formats with which graphics can be embedded within webpages, seems to us quite unreasonable. One possible solution for this is the rise of a new class of web librarians/technicians, who combine competence within one or other intellectual disciplines (in this case, political scientists) with expertise in the development and programming of not only the web, but other sorts of internet media.

12. An artefact of the type of material with which we were dealing.

13. Clearly, other options, which we would have supported, existed. Students had the option, and were thusly informed, to submit assignments, if need be, via fax or paper mail ("snail mail"); for student-to-teacher communications, students were advised that they could call the professor, either at his office, or at home, if they wanted to discuss the class; they could also fax or mail the professor questions which they might have had. This is exemplary of what a wider conception of the notion of multimedia might mean.

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